Citation:

Rawn DF, Forsyth DS, Ryan JJ, Breakell K, Verigin V, Nicolidakis H, Hayward S, Laffey P, Conacher HB. PCB, PCDD and PCDF residues in fin and non-fin fish products from the Canadian retail market 2002. Sci Total Environ. 2006 Apr 15;359(1-3):101-10.

PubMed ID: 15913708

Study Design:

Cross-sectional study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

The purpose of this study was to determine the PCB, PCDD, and PCDF content in fin and non-fin fish products from the Canadian retail market in 2002.

Inclusion Criteria:

N/A

Exclusion Criteria:

N/A

Description of Study Protocol:

Recruitment

Market samples of fresh and salt water fish and shellfish were purchased from retailed in three major urban centers in Canada (Halifax, Nova Scotia; Ottawa, Ontario; and Vancouver, British Columbia) during the winter and spring of 2002. Both farmed and wild fish were purchased, but the majority of samples were farmed because limited wild fish/shellfish was available on the market at the time of year of the study. In addition, sample were collected whether they were fresh, frozen, previously frozen, or live. Samples included: char, crab, mussels, oysters, salmon, shrimp, tilapia, and trout.

Design

Cross-sectional analysis of fish/shellfish on the market in Canada in 2002.

Dietary Intake/Dietary Assessment Methodology (if applicable): N/A

Blinding used (if applicable): N/A

Intervention (if applicable): N/A

Statistical Analysis

- Statistical analyses were performed to determine if concentration differences were due to processing factors or source.
- Due to the imbalance in sample numbers for each of the different categories, statistical analysis were performed as separate 2-way analysis of variance (ANOVA) with species as a common factor.
- Data were assumed to be log normally distributed and truncated at the limit of detection (LOD). Observations below the LOD were samples from the truncated portion fitted to a log normal distribution for PCDDs and PCDFs, and PCB values <LOD were set to the limit of detection.

Data Collection Summary:

Timing of Measurements: All fish/shellfish included in this analysis were purchased in the spring and winter of 2002.

Dependent Variables

- PCDD, PCB, and PCDF content were determined for each fish/shellfish sample via mass spectrometry.

Independent Variables

- Fish species, processing factors (fresh, frozen), and source (wild, farmed) were all determined at the time of purchase.

Description of Actual Data Sample:

Sample: N=129

Fish product	Total collected (n)	Origin		Source	
		Imported (n)	Domestic (n)	Farmed (n)	Wild (n)
Arctic char	11	0	11	6	5
Crab	19	0	19	0	19
Mussels	10	0	10	10	0

Oysters	16	0	16	12	4
Salmon	22	1	21	19	3
Shrimp	17	15	2	13	4
Tilapia	18	13	5	15	3
Trout	16	0	16	16	0

Location: Fish were purchased from retailers in three major urban centers in Canada (Halifax, Nova Scotia; Ottawa, Ontario; and Vancouver, British Columbia).

Summary of Results:

- Total PCB concentrations ranged from 42.3-45,100 pg/g whole weight.
  - PCB 123 was not detected in any sample tested.
  - PCBs 47, 49, 66, 74, 77, 99, 101, 110, 138, 153, 183, 187 were detected in all samples. PCB 153, 138, 118, and 101 were the dominant congers found in the fish tested in the current study.
  - PCB concentrations were highest in salmon.
- PCDD and PCDF concentrations ranged from below method detection limits to 8.23 pg/g whole weight.
  - HpCDD was the most frequently observed PCDD/PCDF
- Lipid content was positively and significantly correlated to PCB concentrations ($p<0.0001$), but not to PCDD/PCDF concentrations ($p=0.55$).
- There were no significant differences between farmed and wild fish in terms of PCB concentrations.

Author Conclusion:

- In all samples tested in the present study, PCB and dioxin levels were below the Canadian guideline values for fish and fish products.
- Health Canada has determined that the exposure of Canadians to PCBs and PCDD/PCDF as a result of fish and shellfish consumption is not at a level sufficient to pose a risk to human health based on the results of this study.

Reviewer Comments:

- *This study did not report the origins of the fish/shellfish tested.*
- *This study did not have farmed and wild samples available for every fish/shellfish tested.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	N/A
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	N/A
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	No
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	No
2.2.	Were criteria applied equally to all study groups?	No
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	No
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	No
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	???
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	No

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	No
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	N/A
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	N/A
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes

9.2.	Are biases and study limitations identified and discussed?	No
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes